[Hadley Church Tower and Beacon.]

## BEACONS.

Hadley, so called from its elevated situation (*head leagh*, a high place), is about 11 miles from London, and a short distance eastward of the town of Chipping Barnet. The parish was formerly a hamlet of Edmonton. The church was erected during the fifteenth century, and consists of a chancel, nave, two aisles, and two transepts. There are several monuments of the seventeenth century, the most remarkable one being that in memory of Sir Roger Wilbraham, solicitor-general of Ireland in the reign of Queen Elizabeth, and his lady, with marble busts of each by Stone; and there is a mural brass of the fifteenth century. At the west end there is a square tower of flint with stone quoins, at the top of which is an iron beacon.

The Anglo-Saxon word *beacen* signifies a sign or signal, and the use of beacons was to alarm the interior of the country upon the approach of a foreign enemy. These sort of fire-signals are of the highest antiquity, and are mentioned in the prophecies of Jeremiah (ch. vi., ver. 1), who says:—"Set up a sign of fire in Beth-haccerim, for evil appeareth out of the north, and great destruction." Æschylus, who wrote his tragedies in the fifth century before the Christian era, represents the intelligence of the capture of Troy as being conveyed to the Peloponnesus by fire-beacons. They were used during the Peloponnesian war (431 to 404 B.C.). Pliny distinguishes this sort of signal from lighthouses by the name of 'Ignes prænuntiativi,' or notice-giving fires. At this day the natives of Australia light fires as signals, which are repeated from one party to the other, and in this way notice is communicated to a great distance in a very short time.

Lord Coke, in his 'Fourth Institute,' gives a description of our own beacons before the fourteenth century:—"Before the reign of Edward III.," he says, "they were but stacks of wood set up on high places, which were fired when the coming of enemies was descried; but in his reign pitch-boxes, as now they be, were, instead of those stacks, set up; and this properly is a beacon." Stow, in his 'Annals,' under the year 1326, states that among the precautions which Edward II. took to guard against the return of the queen and Mortimer to England, "he ordained bikenings or beacons to be set up, that the same being fired might be seen far off, and thereby the people to be raised." The power of erecting beacons was originally in the king; and was usually delegated to the lord high admiral. In the reign of Edward II. (1307—1327), the sheriff of the county levied a sum upon each hundred under the name of 'beconagium,' for the maintenance of beacons.

In the British Museum there are preserved charts of the coast of Dorsetshire and Suffolk, showing the station of the various beacons at the time of the expected invasion of the Spanish Armada. Beacon hills occur in some part or other of most of the counties of England. In unsettled times watches were regularly stationed at these spots, and horsemen called 'hobbelars' were stationed to give notice in the daytime of an enemy's approach, when the fire would not be seen. Sir John Fenn, in a note to the 'Paston Letters,' says that these light horsemen, "by the tenure of their lands, were obliged to maintain their nags, and were expected to be in readiness, when sudden invasions happened, to spread immediate intelligence of the same throughout the country." The guard at the sea-side beacons was required to be larger than at the inland

beacons, as it was often one of the first objects of an invading party to surprise them, and so prevent the alarm of their arrival being spread far and wide. When the Armada was expected directions were issued that the beacons be provided with good matter and stuff, as well for the sudden kindling of the fires as also for the continuance thereof. The blazing of the beacon-fires from a hundred hills, rousing the stalwart spirit of our forefathers in many a remote hamlet and lonely moated grange, would be a moment of intense interest. The inhabitants of a certain district assembled at the particular beacon which by its lurid glare amidst the darkness of night had summoned them from their homes; and in this way the gathering together of an armed force would soon be effected; while, as all pushed forward to some general point, their numbers would swell into a large army. It is reported that the last occasion of Hadley Beacon being used was in 1745, when it lighted the way for the household troops on their progress northwards, immortalised by Hogarth in his exquisite 'March to Finchley.'

At the commencement of the present century, when the invasion of the country by a foreign enemy was generally expected, the beacons were once more put in order, and occasionally some were fired, either as a strategetic experiment, to ascertain the force which could be relied upon in case of sudden need, or from a rumour that the enemy had really landed. How completely altered are now all the means of dispatch and publicity compared to what they were a few centuries ago. Now we have the telegraph, which is capable of transmitting many facts, instead of one only, from one end of a country to the other in the space of a few minutes; and it is serviceable by day, which the beacon was not; and if recourse were had to a fire-signal for night communication, a piece of lime not bigger than a boy's marble, exposed to the action of a flame which in itself is scarcely luminous, would be made to yield a light so intense as to be visible at a distance of sixty or seventy miles.* The concentration of an armed force could be effected on any part of the coast in a few hours by means of railroads. The invaders, instead of waiting days perhaps for a favourable wind before they could descend upon our coasts, would make their unerring approach aided by the power of steam; and on the other hand, fleets of armed steam-ships would oppose them. Let us hope that the time is far distant for a trial of these new resources of war, which modern science has placed in the hands of civilized nations.

## THE OAK.

[Concluded from page 263.]

"THE Chandos Oak stands in the pleasure-grounds at Michendon House, near Southgate, and is about sixty feet high. The head covers a space the diameter of which measures about one hundred and eighteen feet; the girth of the trunk, at one foot from the ground, is eighteen feet three inches. It has no large limbs; but, when in full foliage, 'its boughs bending to the earth, with almost artificial regularity of form, and equidistance from each other, give it the appearance of a gigantic tent.' It forms, indeed, 'a magnificent living canopy, impervious to the day.' (Strutt.)"

"The Merton Oak stands on the estate of Lord Walsingham. It is sixty-six feet high, and, at the surface of the ground the circumference of the trunk is sixty-three feet two inches; at one foot it is forty-six feet one inch; the trunk is eighteen feet six inches to the fork of the branches; the largest limb is eighteen feet, and the second sixteen feet in circumference. The Winfarthing Oak is seventy feet in circumference, the trunk quite hollow, and the cavity large enough to hold at least thirty persons. An arm was blown off in 1811, which contained two waggon-loads of wood. 'Of the age of this remarkable tree,' says Mr. S. Taylor, in a letter to Mr. Loudon, 'I regret to be unable to give any correct data. It is said to have been called the "Old Oak" at the time of William the Conqueror, but upon what authority I could never learn. Nevertheless, the thing is not impossible, if the speculations of certain writers on the age of trees be at all correct. Mr. South, in one of his letters to the Bath Society (vol. x.), calculates that an oak-tree forty-seven feet in circumference cannot be less than fifteen hundred years old; and Mr. Marsham calculates the Bentley Oak, from its girthing thirty-four feet, to be the same age. Now, an inscription on a brass plate affixed to the Winfarthing Oak gives us the following as its dimensions:—"This oak, in circumference, at the extremities of the roots, is seventy feet; in the middle, forty feet: 1820." Now, I see no reason, if the size of the rind is to be any criterion of age, why the Winfarthing should not, at least, equal the Bentley Oak; and, if so, it would be upwards of seven hundred years old at the Conquest; an age which might very well justify its then title of the "Old Oak." It is now a mere shell—a mighty ruin, bleached to a snowy white; but it is magnificent in its decay; and I do wonder much that Mr. Strutt should have omitted it in his otherwise satisfactory list of tree worthies. The only mark of vitality it exhibits is on the south side, where a narrow strip of bark sends forth a few branches, which even now occasionally produce acorns. It is said to be very much altered of late; but I own I did not think so when I saw it about a month ago (May, 1836); and my acquaintance with the veteran is of more than forty years' standing; an important portion of *my* life, but a mere span of *its own*.'" ('Gard. Mag.,' vol. xii., p. 586.)

"The Salcey Forest Oak, Sir Thomas Dick Lauder describes as 'one of the most picturesque sylvan ruins that can be met with anywhere.' It is supposed to be above fifteen hundred years old; and its trunk is so decayed, as to form a complete arch, which is fourteen feet eight inches high, and twenty-nine feet in circumference inside. The tree is thirty-three feet three inches high, and about forty-seven feet in circumference on the outside near the ground. (Strutt.) This fine ruin is still standing; and, though it has latterly become much wasted, it annually produces a crop of leaves and acorns."

"The Parliament Oak grows in Clipstone Park, Nottinghamshire, and derives its name from a parliament having been held under it by Edward I. in 1290. The girth of this tree is twenty-eight feet six inches. Clipstone Park is the property of the Duke of Portland, and is supposed to be the oldest park in England, having been a park before the Conquest, and having been then seized by William and made a royal demesne. Both John and Edward I. resided and kept a court in Clipstone Palace." To this we may add the statement of a correspondent of the 'Doncaster Gazette' of June 24 of the present year, as to the condition of this venerable tree:—"From my own actual admeasurement," says he, "the dimensions are as follows:—Height of the trunk, twenty feet; circumference on the ground, twenty-seven feet seven inches; fourteen feet from the ground, thirty-two feet six inches. Two large arms still remain, which, at the time of my visit, were in full and vigorous growth, and had already made shoots of twenty inches in length. From the quantity of blossom I observed, it bids fair to have an abundant crop of acorns, notwithstanding its extreme age."

"The Shelton Oak, growing near Shrewsbury, mea-

* See No. 514, for an account of the Drummond and Bude Lights.

sured, in 1810, as follows:—Girth, close to the ground, forty-four feet three inches; five feet from the ground, twenty-five feet one inch; eight feet from the ground, twenty-seven feet four inches; height to the principal bough, forty-one feet six inches. ('Gent. Mag.,' Oct. 1810.) The tree was very much decayed in 1813, and had a hollow at the bottom sufficient to hold with ease half a dozen persons. ('Beauties of England and Wales; Shropshire,' 179.) This oak was celebrated for Owen Glendower having mounted on it to observe the battle of Shrewsbury, fought on June 21, 1403, between Henry IV. and Harry Percy. The battle had commenced before Glendower arrived; and he ascended the tree to see how the day was likely to go. Finding that Hotspur was beaten, and the force of the king was overpowering, he retired with his twelve thousand men to Oswestry."

"The Grindstone Oak, near Farnham, was once an enormous tree. Its circumference, near the ground, is still forty-eight feet; and at three feet high, thirty-three feet. It is, however, fast waning to decay."

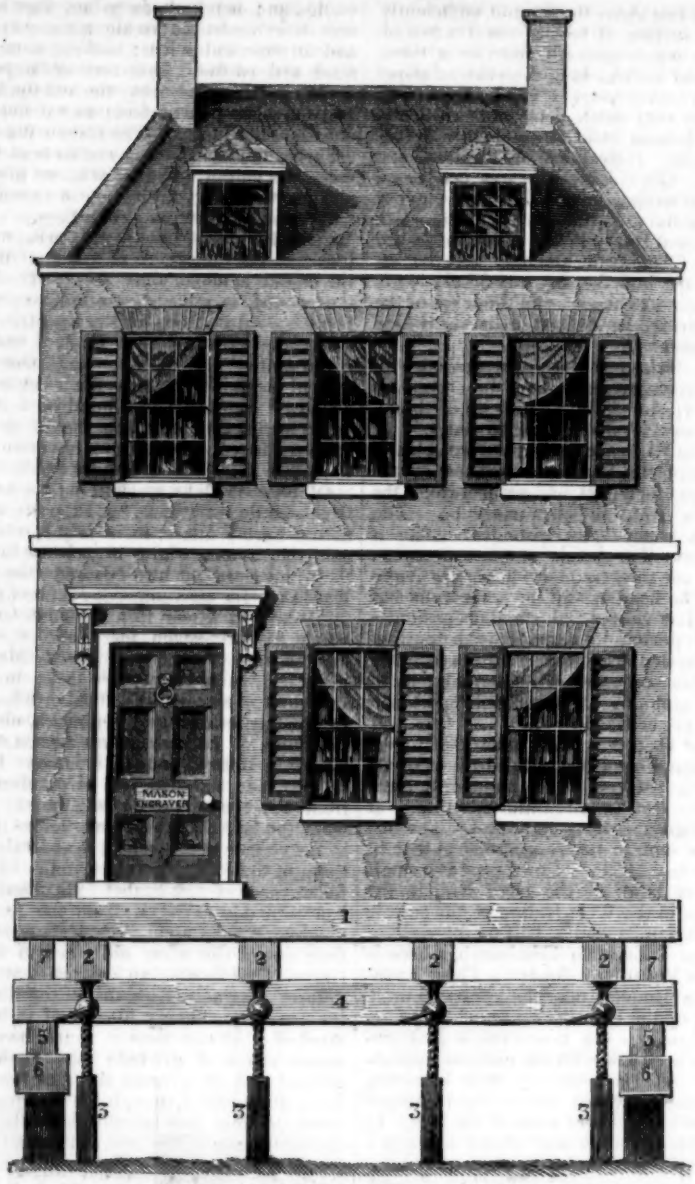
"The Bull Oak, in Wedgnock Park, is a remarkable specimen of an oak of this kind. It measures at one foot above the ground forty feet, and six feet from the ground thirty-seven feet, in circumference. The height of the trunk is about seventeen feet before it throws out branches. The inside is quite decayed; and, being open on one side, cattle are generally found sheltering in it. The head is still in a vigorous and flourishing state. The Gospel Oak stands near Stoneleigh Abbey; and it derives its name from the custom which formerly prevailed, when the minister and other officers of the parish went round its boundaries in Rogation Week, of stopping at remarkable spots and trees to recite passages of the Gospel."

"The Cowthorpe Oak is a very remarkable tree. The following are the dimensions of this tree, as given in Hunter's 'Evelyn:'—Close to the ground, it measured seventy-eight feet in circumference; and at three feet from the ground, forty-eight feet. The following account was sent to us by a correspondent in Yorkshire, in October, 1829:—'Cowthorpe is a small village on the right bank of the river Nid, in the wapentake of Clare, in the West Riding of the county of York, and about a mile and a half on the right of the great road from London to Edinburgh, where it crosses the river by Walshford Bridge. This stupendous oak stands in a paddock near the village church, and is the property of the Hon. E. Petre, of Stapleton Park, near Ferrybridge. On a stranger's first observing the tree, he is struck with the majestic appearance of its ruined and riven-looking dead branches, which in all directions appear above the luxuriant foliage of the lateral and lower arms of the tree. In 1722 one of the side branches was blown down in a violent gale of wind; and, on being accurately measured, was found to contain upwards of five tons of wood. The largest of the living branches at present extends about forty-eight feet from the trunk; and its circumference, at about one yard from the giant bole, is eight feet six inches. Three of the living branches are propped by substantial poles, resting upon stone pedestals. The diameter in the hollow part, at the bottom, is nine feet ten inches: the greatest height of the dead branches is about fifty-six feet. It is evidently of very great antiquity, as all tradition represents it as a very old tree."

"In Bagot's Park, near Blithefield, about four miles from Lichfield, there are several very remarkable trees. Bagot's Park is the seat of Lord Bagot, who may be regarded as one of the greatest planters of 'oaks in the kingdom, having planted two millions of acorns on his estates in Staffordshire and Wales.' (Strutt.) The Squitch Oak has a clear trunk thirty-three feet high, which contains six hundred and sixty cubic feet; one limb, forty-four feet long; and fourteen other limbs containing altogether three hundred and fifty-two cubic feet: making a total of one thousand and twelve cubic feet of timber. The total height is sixty-one feet; the circumference, near the ground, is forty-three feet; and at five feet, is twenty-one feet nine inches. The Rake's Wood Oak is a very old tree, and has lost many of its branches and several feet of its height. It is now about fifty-five feet high, and pretty nearly thirty feet in circumference at five feet from the ground. The Beggar's Oak is also in Bagot's Park, and has a trunk twenty-seven feet three inches in circumference at five feet from the ground: the height is about sixty feet. 'The roots rise above the ground in a very extraordinary manner, so as to furnish a natural seat for the beggars chancing to pass along the pathway near it; and the circumference taken around these is sixty-eight feet. The branches extend about fifty feet from the trunk in every direction. This tree contains eight hundred and seventy-seven cubic feet of timber, which, including the bark, would have produced, according to the price offered for it in 1812, 202*l.* 14*s.* 9*d.*'—('Lauder's Gilpin,' i., p. 254.)"

Of Scottish Oaks we will only quote the notices of two:—In Renfrewshire, "at Ellerslie, the native village of the hero Wallace, there is still standing 'the large oak tree,' among whose branches it is said that he and three hundred of his men hid themselves from the English. Its circumference at the base is twenty-one feet; and at fifteen feet, thirteen feet two inches; its height is sixty-seven feet; and the expanse of its boughs is, east forty-five feet, west thirty-six feet, south thirty feet, north twenty-five feet; thus spreading over an extent of nineteen English, or fifteen Scotch, poles. In Roxburghshire, near Jedburgh, on the estate of the Marquess of Lothian, stands a remarkable oak, called the King of the Woods. 'It is now (January 19, 1837) sixteen feet six inches in circumference, at one foot from the ground; its whole height is seventy-three feet; the height of the trunk, before it forms branches, is forty-three feet; and it is as straight as, and something of the form of, a wax candle. It is, perhaps, the finest piece of oak timber in Scotland; and its beauty has probably saved it from the axe, for it, and its neighbour, the Capon Tree, seem to be a century older than any of the other old trees in the county. The Capon Tree is also an oak; but it possesses quite a different character from that of the King of the Woods; the trunk, and every branch of it, being excessively crooked. At one time it must have covered an immense space of ground; but, from being long neglected and ill pruned, the size has been for many years diminishing, though the Marquess is now having every possible care taken to keep the tree alive. The circumference of this tree, at two feet from the ground (for it is all root under that height), is twenty-four feet six inches; and the whole height is fifty-six feet: the space the branches overhang is above ninety-two feet in diameter. This last tree is said to have been the place where the border clans met in olden times; and hence the name of Capon, from the Scotch word *kep*, to meet. It stands in a haugh (meadow) close by the side of Jedwater; and the King of the Woods on the top of a bank, about three hundred or four hundred yards south of it, and both near the old Castle of Ferniherst, and about a mile and a half above the burgh of Jedburgh.'"

This list might be increased to an almost indefinite extent, as every county in England, and almost every district, has its oaks remarkable for their size, or for some peculiarity or association. We have, however, already exceeded our limits, led on by the interest we have taken in these vast living monuments of departed ages, and must therefore close.




[Elevation of House.]

## METHOD OF REMOVING HOUSES IN AMERICA.

THE removing of houses from one spot to another not far distant is not a novelty in England, and is very commonly performed at the present day in America.* While houses were constructed principally of timber, the difficulty was not very great, arising chiefly from the heavy weight to be moved, as, when loosened from their foundations, the elasticity and adhesion of their materials were sufficient to keep them together during the process; but in houses constructed of brick the difficulties are evidently greatly increased, and the necessity for a much larger share of ingenuity and contrivance required. Though this latter process is not altogether unknown in England, indeed a light-house in Northumberland of considerable size has been lately removed to some distance from its original site, yet it has been chiefly in America that the plan has been practised, where it has been found eminently useful in enabling them to widen the streets or improve the plans of their rapidly-growing towns. As the subject is of some interest, we will endeavour to give a description of the method of proceeding.

In the building to be removed, which must be a detached one (or the whole block may be removed if not too large), corresponding openings are made in

* Stow mentions, in his 'Survey of London,' 1598, that his father's house in Throgmorton Street was loosened from the ground, and removed on rollers to a distance of 22 feet, by the order of Thomas Cromwell, afterwards Earl of Essex, who was desirous of enlarging his garden.

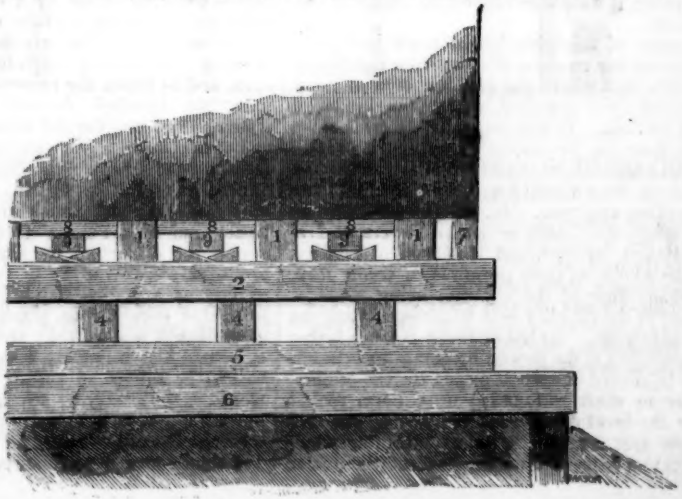
each of the end walls just above the ground, sufficiently large to admit the insertion of beams about a foot or fifteen inches square, which project about two or three feet from each end, and are placed at intervals of about four feet from each other (marked 1 in the engravings); the projecting ends resting on blocks of wood fixed firmly on the ground, clear of the walls. When the beams are placed, wedges are driven between their projecting ends and the fixed blocks in order to drive them up tightly against the upper part of the wall, thus supplying the place of the bricks knocked away, and supporting the weight of the walls. This done, the foundation of the end walls may be removed, the intermediate brick-work taken away, and a clear space left for further operations. The same operation is then pursued with the front and back walls, the beams, No. 2, passing below and across those first laid, and resting like them on blocks outside the walls. The foundation being now wholly laid bare, the two sets of timbers are forced closely up to each other and to the brick-work by upright screws placed on the ground beneath them, No. 3. This operation relieves the blocks, on which the projecting ends rested, of the weight of the house, and they are taken away; the house now resting entirely on the timber frame-work, sustained by the screws. The ground beneath is now dug away, and a set of fixed slides, or ways, as they are commonly called (6 in engravings), are placed exactly where the foundations of the end walls had previously stood; on these ways, in which deep grooves are cut, are placed a set of cradles, similar to those used in ship-yards (5 in engravings), which have a projection or feather, corresponding with and intended to move in the grooves of the ways, both being previously well greased, and between these cradles and the timbers marked 2 the beams marked 4 are inserted at right angles with both pieces of wood, and wedges are then driven in at various parts to tighten the whole in order to bring the entire weight of the building on to the cradles, and consequently upon the ways on which they rest; figs. 7, 8, and 9, in the engraving of the end wall, show some of the ways in which these strengthenings are applied. When this is effected the supporting screws can be withdrawn, and the whole of this complicated frame-work is so well fastened together, that there is little danger of the edifice it supports getting deranged in the act of moving. It is scarcely necessary to add that the ways must be laid continuously to the exact spot in which the house is to be deposited, where, in general, a new foundation has been prepared for it. The screws are then placed horizontally against the cradles, and, being made to act together, the cradles with their burden move along the ways at the rate of three or four feet per day to their place of destination. When arrived there, by inverting the process, the timbers are withdrawn one by one, and the house is permanently fixed in its new situation without injury to itself, and frequently without even removing the furniture.

The following curious accounts of the application of this invention in New York, we give in the words of the correspondent, to whom we are indebted for the materials of the previous notice:—

"Chapel Street, in New York, was widened by order of the Corporation; many of the houses were moved back, and some pulled down. At the corner of Chapel and Leonard streets stood a large and strong brick building used as a blacksmith's workshop: this lying in the way of the improvement, had to be removed: it was sold by auction, and was purchased very cheaply by a person who owned a small house adjoining it in Leonard Street, with some ground behind it. The speculative purchaser first moved the small house in Leonard Street, beyond the extremity of the blacksmith's shop, and turned its front towards Chapel Street; he then moved back the blacksmith's building the required number of feet, and brought it on a level with the small house previously moved. Out of the old workshop he formed three handsome three-story houses, with shops, and made additions to the small house, so that the whole now presents a line of four houses.

"In a more recent improvement, Centre Street was widened and extended, in order to join a main thoroughfare by the City Hall. Many houses were pulled down, and carried back as in other instances, but there was one well-built brick house that stood completely across the proposed roadway. There was not sufficient room on either side to receive it wholly, so the ingenious proprietor, rather than sacrifice his house, conceived the idea of dividing it from top to bottom through the three floors: this he actually accomplished, and the two distinct parts were conveyed to opposite sides of the street, in which state I saw them before the chasms in the walls had been been supplied. He then perfected them, and they form now two separate, though narrow buildings.

"The cost of moving a moderate-sized brick dwelling is about one hundred dollars, very considerably less, even with the new brick-work, than the expense of pulling down and rebuilding, besides saving much time. A Mr. Simeon Brown of New York is said to have been the projector of this peculiar and useful operation: he died, I believe, only a few months since."



## RECENT IMPROVEMENTS IN LIGHT-HOUSES.

SINCE our descriptions of the Eddystone and North Foreland Lighthouses were published in Nos. 20 and 222 of the 'Penny Magazine,' many projects have been partially or fully acted on, tending to the introduction of considerable changes in the general principle of construction in these invaluable beacons. We shall endeavour, in two short papers, to present a general outline of the improvements to which we allude, and which we may classify thus:—1st, lighthouses constructed of iron; 2nd, Mitchell's screw-pile lighthouses; 3rd, beacons for sand-banks; 4th, lighthouses for sand-banks; 5th, suggested improvements in the lights or lamps.

In a country where we have iron ships, iron carriages, iron roads, and iron buildings, it is not wonderful that the employment of the same metal as a material for lighthouses should have been suggested. Consummate as was the skill displayed by Smeaton in the Eddystone lighthouse, we are disposed to think that a much less ponderous mass of material will be generally used in future operations of the kind. But without anticipating the future, it will be sufficient to notice what is now doing in this way. When it was proposed a few years ago to construct a lighthouse on the Wolf Rock near the Land's End, Captain Brown, the engineer of the Brighton chain-pier, offered to construct one of iron, or, at a higher cost, of bronze. He proposed that it should be ninety feet high, fourteen feet in diameter at the bottom, and four at the thinnest part; the structure being built up of separate truncated conical pieces of cast-iron, fitting one on another something like the joints of a telescope. Above the column was to be a keeper's house, surrounded by an open gallery which overhung the pillar, and surmounted by the lantern. Within the body of the column were to be the sleeping-berths for the attendants; and store-rooms for provisions, coals, water, and oil. Captain Brown's estimate of the advantages likely to result from the adoption of such a plan related to the following points:—That the expense would be very much smaller than that of a stone lighthouse; that the time of erection would be much shorter; that by the slenderness of its shaft, it would not present such a wide surface for the sea to act against as a stone lighthouse; that it would have but eight joints from the ground to the lantern, whereas a stone lighthouse has many thousands; and that from the whole circumference of each stage or story being cast in one piece, it would be capable of resisting immense pressure.

A modification of this plan has been put into practical operation by the erection of a cast-iron lighthouse in Jamaica, at a spot where the erection of a stone or brick one would have required a heavy outlay and a long period of time. It was expected to be lighted for the first time on New-Year's Day in the present year; and the details of its construction (for which we are indebted to the 'Civil Engineer's Journal') are as follow:—The engineer, Mr. A. Gordon, formed the design after the Celtic or round towers of Ireland; and Messrs. Bramah and Robinson, of Pimlico, exhibited the whole on their premises in about *three months* from the time of the contract being made; a striking proof of the rapidity with which such plans can be put into execution. As the diameter is much larger than that mentioned in the preceding paragraph, the circumference is formed of several pieces, instead of one.

The tower or shaft is founded on a coral rock, a little above the level of the sea; the face of this rock is about ten feet beneath a sandy stratum, which will be excavated to receive the base of the tower, resting on and cased with granite, to prevent the filtration of sea-water from acting on the iron. This course of granite is grooved to receive the flange of the lower plates of the tower, from which lightning-conductors are to proceed to the sea. The diameter of the tower-shaft is eighteen feet six inches at its base, diminishing to eleven feet at the top: it is formed of nine tiers of plates, each ten feet in height, from four to five feet in width, and nearly an inch thick. The circumference is formed of eleven plates at the base and nine at the top: they are cast with a flange all round the inner edges, and when put together these flanges form the joints, which are fastened together with nut-and-screw bolts, and caulked with iron cement. The 'cap' to the column consists of ten radiating plates, which form the floor of the light-room: they are secured to the tower upon twenty pierced brackets, and are finished by an iron railing. The lower portion of the tower, to about one-fourth of its height, is filled up with masonry and concrete to form a solid centre; and above this are the necessary rooms for the attendants and the stores. The light-room consists of cast-iron plates five feet high, whereon are fixed metal sash-bars filled with plate-glass. The light is of the revolving kind, consisting of fifteen Argand lamps and reflectors, five in each side of an equilateral triangle, and so placed as to constitute a continuous light, but with periodical flashes. To preserve as low a temperature as the circumstances and climate will permit, the iron shaft or tower is to be lined with a non-conducting material, such as slate or wood, leaving an interstice through which a constant ventilation will be effected, so as to carry off the excessive heat. The lower portion of the exterior is to be coated with coal-tar, to prevent oxidation. The whole arrangements were so planned, that the lighthouse could be erected from within, without the aid of any external scaffolding; and the expense was estimated at about seven thousand pounds. This lighthouse is, we believe, the first of its kind actually erected; and time will show how far it is fitted for the object in view.

The next improvement we have to notice is that of Mitchell's screw-pile lighthouse, one of the most remarkable applications of the screw ever perhaps attempted. The first application of Mr. Mitchell's invention was, we believe, in reference to *moorings* for ships, which, under the common system, usually consist of a strong chain stretched along the bed of the harbour or port, and secured at its extremities by anchors or heavy blocks of stone, the ship being connected with the chain by a cable. Under these circumstances accidents often occur, such as a ship's anchor catching in the ground-chain, or a ship's keel striking on the mooring-block. To obviate these evils, and to lessen the expense of constructing moorings, Mr. Mitchell devised a cast-iron instrument which *screws* into the soil forming the bed of the river, and thus obtains a very powerful hold. The screw is from two to five feet in diameter, according to circumstances; but its thread, or inclined path, winds only one and a half times round the centre. At the upper end of the screw (the length of which about equals the diameter), the shaft or spindle is brought to a square shape, so as to be wound round by a key exactly as a pocket-watch is wound up. A key is formed of jointed rods, placed end to end, till a sufficient length is acquired; and by this means the screw is turned till it wholly enters the ground, where it 'bites' or clings so tightly that an immense force would be necessary to tear it up. To the upper end of the screw is attached links and other apparatus whereby it can be connected with the cable of a ship, and thus a mooring-anchor is produced.

The success which attended this invention led the Corporation of the Trinity House to consider how far the principle might be available in the construction of lighthouses on sand; and Mr. Walker, their engineer, was directed to test the question on the Maplin Sands lying at the mouth of the Thames, about twenty miles below the Nore. This sand, which is a shifting one, and dry at low-water, forms the northern side of the King's Channel, through which a large number of ships pass on their way up the river. As the sand has not stability enough to support masonry, the idea was conceived of building a skeleton lighthouse whose piles or uprights should be *screwed* into the soil on Mitchell's principle. In August, 1838, operations commenced. Eight shafts of wrought-iron were inserted in the sands, nearly upright, and arranged so as to form an octagon, with a ninth quite upright in the centre. These shafts were about twenty-five feet long, and five inches in diameter; and at the lower end of each was a screw nearly five feet in diameter. It was by this means that the shafts were made to penetrate the sands, which they did to the depth of twenty feet, the screws being driven by thirty men acting on a capstan erected above. In about nine days all the nine shafts were driven, till their upper ends stood about five feet above the surface of the sands, and forming an octagon forty feet in diameter.

The foundation being thus made, matters were left till the spring of 1839, when the intervening space was strengthened in various ways; and the manufacture of the superstructure resolved on. After some delay, the framing was commenced in August, 1840. The lower part consists of eight cast-iron pillars, eighteen feet long, eleven inches diameter externally, and nine internally: these are fixed at the angles of the octagon, and a ninth is placed in the centre. The lower part of each pillar forms a socket, which is fitted over the top of the corresponding screw-shaft to the extent of four feet, and there fastened by screws. These pillars incline towards the centre; and at the upper end of each is a socket for receiving the principal parts of the timber framing. The pillars, which are braced and bound strongly together, stand about four feet above the highest water-mark. On these pillars is erected a frame-work of stout timbers, consisting of beams proceeding in various directions, and fastened firmly to the iron pillars. Up to the height of about twelve feet above high-water mark, the structure is left quite open and pervious to air and water; but above this elevation is a wooden residence for the attendant, consisting of a living-room about twenty feet long, a store-room in the upper part, and store-rooms for coals and water in the lower.

The structure was thus far completed by the month of October, 1840, and immediately afterwards arrangements were commenced for fixing the lights. Above the living-room is fixed the lantern with a gallery all around; being a polygon of sixteen sides, twelve feet diameter internally, and sixteen feet high from the floor to the roof. The principal part of the framing is of cast-iron; the roof, the interior lining, and the floor being covered with copper. In the centre, upon a pedestal, is the dioptric light-apparatus, which may be clearly seen from the deck of a vessel, in fine weather, upwards of ten miles off, in all directions. On the 10th of February, 1841, the light was first exhibited; and instructions, emanating from the Trinity House, were issued for the guidance of mariners in respect to this lighthouse.

While these operations were going on, a still bolder application of the "screw-pile" was exhibited in the construction of a lighthouse in the mouth of the River Wyre, where a sand-bank threatened to be the source of much danger to shipping entering Port Fleetwood, if not pointed out by some such beacon. So far as the Wyre lighthouse differs from that at Maplin, we may briefly describe it. The structure is a hexagon, instead of an octagon, there being six screw-piles at the six angles, and a seventh in the centre. The diameter of the hexagon is nearly fifty feet at the base, but less than thirty at the top. Each pile is fifteen feet long and five inches diameter, and at its lower end is a three-foot screw, by which it is driven into and firmly attached to the sand. The pillars, instead of being iron, as at Maplin, are of Baltic timber, and are nearly fifty feet in length. The pillars, being hollowed at the lower end, are fitted on the tops of the shafts, and thus form a skeleton which rises considerably above the highest water-mark. The great height of these pillars is rendered necessary by the fact that the difference between the very highest and the very lowest tides is as much as thirty feet. On the top of the open frame-work is the attendant's dwelling, a hexagon of twenty-two feet diameter; and above this is the lantern, a twelve-sided room, about ten feet in diameter, so arranged that the lights within are about thirty feet above the highest tide-level, and sixty above the lowest.

A little reflection will show how remarkably this mode of construction differs from that hitherto adopted for lighthouses. Here is a structure entirely supported by seven posts or piles, driven, not into firm rock, but into loose sand, or at least loam, which has hitherto baffled the efforts of engineers to render it stable and firm. The hold obtained for the seven posts is in reality nothing more than one and a half turns of a screw, fixed to the lower end of each post. Above the screw-shafts are erected pillars of timber, fitting by sockets in the upper end of the shafts; and above these again is a dwelling for the attendant, and a house or lantern to contain the light. The main structure, too, instead of presenting to the violence of the waves a surface which has, in some instances, been supposed to be exposed to a pressure of one hundred tons, consists only of skeleton frame-work, presenting the least possible amount of resisting surface. One of the most remarkable circumstances connected with this mode of construction is the celerity with which the various parts can be put up. The Wyre light-house was reared in two winter months, when the amount of daylight was so small as to render necessary the prosecution of the operations by moonlight or the light of flambeaux!

[To be continued.]

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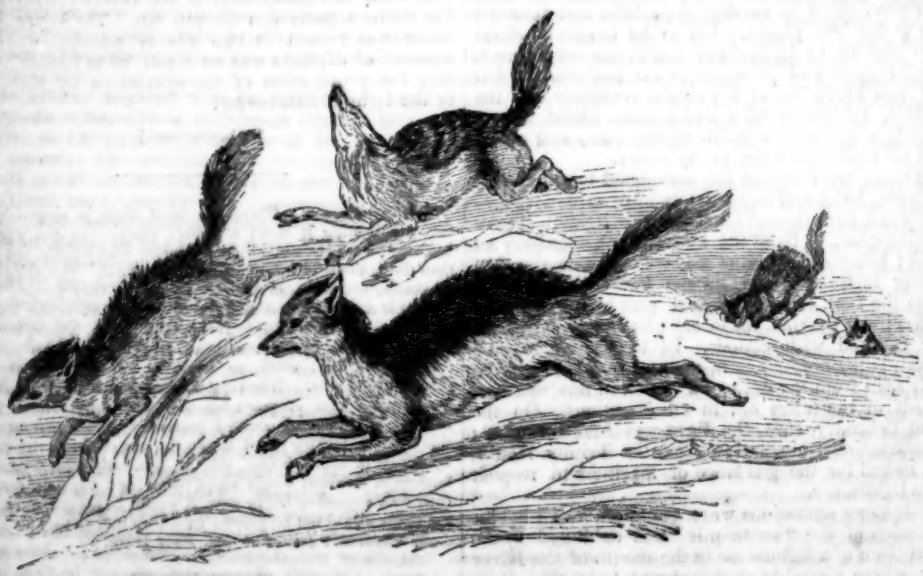
*German Waggons.*—There is a great trade in charcoal here: they are loading it now; and they contrive to put enormous loads in their light and slight waggons, with wheels not larger than the fore-one of our carriages in England. But the perch is moveable, and they can make it any length they please: it is of so simple a construction that every farmer can repair his own, and make anything of it. If he has a perch, a pole, and four wheels, that is enough: with a little ingenuity he makes it carry stones, hay, earth, or anything he wants, by putting a plank at each side. When he wants a carriage for pleasure, he fits it up for that purpose; his moveable perch allows him to make it anything. I counted seventeen grown persons sitting side by side, looking most happy, in one of them, drawn only by a pair of small horses, and in this hilly country. If the farmers in England would adopt these light waggons, instead of their own expensive heavy ones, it would be a great saving, and the roads would not be ground into deep ruts as they are now.—*Lady Vavasour's Last Tour and First Work.*

## THE JACKAL, OR TSCHAKKAL.

THIS animal is of a yellowish-grey colour above, whitish below, thighs and legs yellow, ears ruddy, muzzle very pointed, tail reaching hardly to the heel (properly so called). The colours sometimes vary, and the back and sides are described by Mr. Bennett as of mixed grey and black, and as abruptly and strikingly distinguished from the deep and uniform tawny of the shoulders, haunches, and legs. The head nearly of the same mixed shade with the upper surface of the body. It inhabits India and other parts of Asia, and Africa. Cuvier says that jackals are met with from India and the environs of the Caspian Sea to Guinea, but that it is not certain that they are all of the same species. Their habits gregarious, hunting in packs, and the pests of the countries where they are found, and where they burrow in the earth. In their huntings the jackals will frequently attack the larger quadrupeds, but the smaller animals and poultry are their most frequent prey. Their cry is very peculiar and piercing. Captain Beechey notices it as having something rather appalling when heard for the first time at night; and he remarks, that as they usually come in packs, the first shriek which is uttered is always the signal for a general chorus. "We hardly know," continues the Captain, "a sound which partakes less of harmony than that which is at present in question; and indeed the sudden burst of the answering long-protracted scream, succeeding immediately to the opening note, is scarcely less impressive than the roll of the thunder-clap immediately after a flash of lightning. The effect of this music is very much increased when the first note is heard in the distance (a circumstance which often occurs), and the answering yell bursts out from several points at once, within a few yards or feet of the place where the auditors are sleeping."

The jackal is frequently alluded to in the sacred writings. "The Hebrew word *shual*," says the author of the 'Illustrated Commentary on the Old and New Testaments,' speaking of the use made of them by Samson, "rendered 'fox' in our version, is now generally agreed to be, in most cases, the jackal (*canis aureus*). This animal is well enough depictured as something between the wolf and the fox, whence some naturalists are disposed to describe it as 'the wolf-fox.' It is about the size of the former animal. The upper part of the body is of a dirty yellow; a darker mark runs upon the back and sides; and the under parts are white. The jackals associate together like the wolves, and form large packs, sometimes, in Palestine, of about two or three hundred; differing in this respect from the fox, which is not gregarious. In such packs, they prowl at night in search of prey, which chiefly consists of carrion, to obtain which they approach to the towns and villages, and sometimes enter and prowl about the streets when they can gain admittance. In some towns, large numbers remain concealed during the day, in holes and corners, which they leave at night to scour the streets in search of food. It is often necessary to secure the graves of the recently dead with great care, to prevent the corpse from being disinterred and devoured by these animals. The howlings of these packs of jackals are frightful, and give great alarm to travellers; hence they are also called in Hebrew *ayim*, 'howlers.' They do not molest man, unless when they can do so with great advantage, as when he lies asleep, or disabled by wounds or sickness The jackals, like the foxes, live in holes which they form in the ground: they are particularly fond of establishing themselves in ruined towns, not only because they there find numerous secure retreats, ready made, or completed with ease, but because the same facilities attract to such places other animals, on some of which they prey. From this circumstance, the prophets, in describing the future desolation of a city, say it shall become the habitation of jackals; a prediction verified by the actual condition of the towns to which their prophecies apply. But the common fox is also of frequent occurrence in Palestine; and *it* appears that the Hebrews included both it and the jackal under the name of *shual*, although the latter was sometimes specially distinguished as the *ayim*. It must therefore, in most cases, be left to the bearing of the context to determine when the jackal and the fox are respectively denoted, by the name (*shual*) common to both."



[Jackals.]